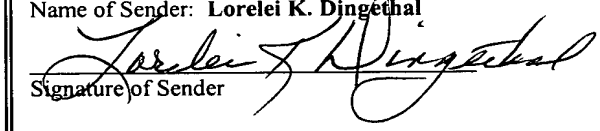
02-ASD-184 (GT)

TITLE OF INVENTION **FUEL VAPOR VENT VALVE AND METHOD OF ATTACHING SAME TO A TANK**

INVENTORS: **KENNETH M. SPINK**
RUDOLPH BERGSMA, DECEASED (by His Legal Representative, Rosemary Bergsma)

Express Mail" Mailing Label No. **EU 505 570 113 US.** Date of Deposit **September 15, 2003** I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" Service under 37 CFR 1.10 on the date indicated above and addressed to the Mail Stop Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Name of Sender: **Lorelei K. Dingethal**



Signature of Sender

TITLE OF INVENTION

[0001] Fuel Vapor Vent Valve And Method Of Attaching Same To A Tank.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to fuel vapor vent valves employed in vapor emission controls systems in motor vehicle fuel tank installations. The invention particularly relates to float operated vent valves attached to the upper wall of a non-metallic fuel tank. Valves employed for such applications are commonly mounted onto the tank through an access opening formed in the upper wall with portions of the valve extending outwardly over the opening and attached to the outer surface of the tank in a sealing arrangement, as for example, by weldment of compatible non-metallic material to the surface of the tank.

[0003] Heretofore the weldment has been by hot-plate or sonic welding techniques which have proven relatively costly in mass production. Heretofore, attempts to spin weld a fuel vapor vent valve of the present type have resulted in destruction of the valving surfaces by the extreme rotational accelerations and decelerations. Furthermore, proper or accurate orientation of the vent hose connector was not possible with spin welding. However, spin welding has been desired as a more cost effective way of attaching the vent valve to the tank than hot-late or sonic welding.

BRIEF SUMMARY OF THE INVENTION

[0004] The present invention provides a float operated vapor vent valve for a fuel tank which may be assembled through an access opening formed in the upper wall of the tank with the float operated valve extending interiorly of the tank and a vent port connection extending exteriorly of the tank. The valve has a flange formed of material compatible for welding to the outer surface of the tank to effect a permanent sealing attachment thereon. The float is slidably movable

in the float chamber and has surfaces thereon engaging the wall of the float chamber to prevent relative rotation of the float valve member with respect to the valve body. The slidable rotary float constraint enables spin welding of the flange to the tank without loss of calibration or damage to the valve components. An optional gravity operated pressure relief valve may be incorporated in the vent passage; and, the relief valve also has surfaces thereon slidably engaging the wall of the vent passage to prevent relative rotation of the relief valve poppet during spin welding.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] FIG. 1 is a cross section of a valve employing the present invention;

[0006] FIG. 2 is a sectional view taken along section indicating line 2-2 of FIG. 1;

[0007] FIG. 3 is a section view taken along section indicating line 3-3 of FIG. 1;

[0008] FIG. 4 is a cross section of an alternate embodiment of the invention shown mounted through an access opening in a fuel tank;

[0009] FIG. 5 is a section view taken along section indicating line 5-5 of FIG. 4; and

[0010] FIG. 6 is a section view taken along section indicating line 6-6 of FIG. 4.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Referring to FIG. 1, a valve assembly indicated generally at 10 has a unitary or one piece body indicated generally at 12, formed with an upper or exterior portion 14 with an annular mounting flange 18 and a lower portion 16 intended for extending interiorly of the tank. The upper portion has a fitting 20 provided thereon with a vent passage 22 formed therein; and, fitting 20 is adapted for having a flexible hose received thereon for connection thereto.

Passage 22 communicates with a downwardly extending passage 24 which has a valve seat 26 formed at the lower end thereof.

[0012] The lower portion 16 of the body has a float chamber 28 formed therein into which is received a float member 30 with a resiliently flexible valve member in the form of a pivoted flapper pad or disk 32 disposed on the upper end of the float 30 for movement therewith.

[0013] The float 30 is biased upwardly by a spring 32 with one end registered against the lower end of the float 30 and the opposite end of the spring 32 registered against an end cap or closure member 34 secured in the lower end of the float chamber 28. The spring is calibrated to provide the desired buoyancy force in the fuel to be used in a known manner. It will be understood that when the fuel level in the tank rises to a certain level, upward movement of float 30 causes valve member 32 to close against valve seat 26.

[0014] Referring to FIGS. 2 and 3, the float 30 has at least one and preferably a plurality of oppositely disposed engagement surfaces in the form of longitudinal groves 36, 38 formed therein; and, the wall of the float chamber 28 has correspondingly configured engagement surfaces in the form of projections 40, 42 provided thereon which slidably engage the groves 36, 38 respectively. Upon spin welding of the body flange 18 onto the fuel tank the sliding engagement of the projections 40, 42 with the grooves 36, 38 prevents relative rotation of the float with respect to the body and thus prevents damage to the float and valve member and any deleterious effects on the calibration of the float spring 32.

[0015] Referring to FIGS. 4, 5 and 6, another embodiment of the invention indicated generally at 50 is illustrated and includes a body 52 having a float chamber 54 formed therein with a float assembly indicated generally at 56 slidably received therein and retained by a cap or closure 58 attached to the lower end of the body. The float assembly 56 includes a resilient valve member 60 disposed and captured on the upper end of the float 56.

[0016] The upper end of the body is attached to a cover member 62 which is disposed exteriorly of the wall of a fuel tank 64 with portions thereof extending

through an access opening 66 formed in the tank wall 64. The cover 62 has an annular flange 68 extending outwardly of the access opening 66 and which is retained and sealed on the outer surface of the tank wall 64 by spin welding.

[0017] The upper end of the body defines a vent passage 70 having a valve seat 72 associated therewith which is disposed vertically in line with the valve member 60, and, valve seat 72 is closed by valve member 60 upon upward movement of the float when the fuel level rises to a level causing the float to close the valve. Vent passage 70 communicates with an upward passage 74 which communicates with a vent outlet 76 formed in a fitting 78 adapted for receiving an end of a hose thereover.

[0018] The body 52 is attached to the cover 62 by snap locking of barbs 80 into apertures or recesses 81 formed in the cylindrical portion 82 of the cover which extends downwardly through the access opening 66.

[0019] The upper end of the body 52 is attached and secured to the cover by a labyrinth seal indicated generally at 84; and, the assembly of the body 52 and the cover 62 is attached to the upper surface of the tank 64 by spin welding.

[0020] Referring to FIG. 5, the float assembly 56 has at least one and preferably a plurality of engagement surfaces in the form of longitudinally extending grooves 84 formed therein which are slidably engaged with a correspondingly disposed pair of engagement surfaces or guides 86 formed on the inner periphery of float chamber 54.

[0021] Referring to FIGS. 4 and 6, a gravity operated pressure relief valve member 88 is slidably disposed in the passage 75 formed as a counter bore on the upper end of vent passage 70, with a valving surface 90 formed on the lower end thereof for seating against the upper end of the vent passage 70. The valve member 88 has a plurality of projections or engagement surfaces 92, 94, preferably formed by cross pins, which are slidably received in the slot 96 formed in the upper end of the body 52. The engagement of pins 92, 94 with the slot 96 prevents rotation of the valve member 88 during spin welding.

[0022] The present invention thus provides for spin welding attachment of a

fuel vapor vent valve to the exterior surface of a fuel tank which eliminates the need for a heating device for welding. The invention permits spin welding without disturbing the interior components and calibration of the vapor vent valve during spinning. The valve of the present invention includes surfaces on the float and on an optional gravity pressure relief valve which slidably engage corresponding surfaces on the valve body to prevent relative rotation of the respective parts during the spin welding operation.

[0023] Although the invention has hereinabove been described with respect to the illustrated embodiments, it will be understood that the invention is capable of modification and variation and is limited only by the following claims.